

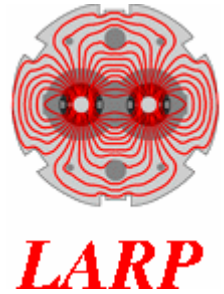


# LHC Accelerator Requirements

**Elvin Harms/FNAL**  
**July 21, 2005**



# Requirements Review

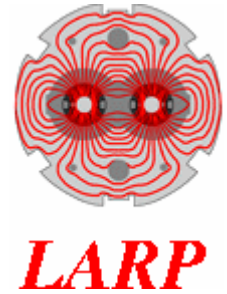


## Schedule for the July 21 Review:

- 7:30 am Executive session
- 8:00 am Introduction to LHC@FNAL (Erik)
- 8:10 am CMS Detector Requirements (Patty)
- 8:50 am LHC Accelerator Requirements (Elvin)
- 9:30 am Executive session



# Introduction



- Key players
- LHC Assumptions
- Scenarios
- LHC Requirements
- Joint Requirements
- Summary



# Key Players

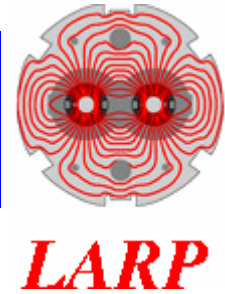


## Key Players

- Suzanne Panacek (CD)
- Elvin Harms (AD)
- Mike Lamm (TD)
- Mike Lamont (CERN)
- Elliott McCrory (AD)
- Jean Slaughter (AD)
- Counsel from
  - Roberto Saban, Markus Albert, Guy Crockford (CERN)



# Assumptions



## For LHC

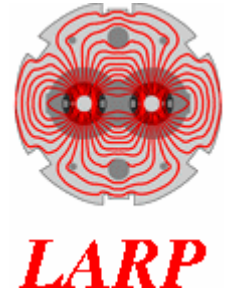
- Individuals working in a Field Control Room (FCR) in the LHC tunnel will have access to telephone communications with international calling capabilities.
- Individuals working at the CERN Control Centre (CCC) will have access to telephone communications with international calling capabilities.
- US/LARP personnel will be at CERN to coordinate activities between the CCC and LHC@FNAL.
- The degree to which LHC@FNAL users have access to the LHC control system will be determined by LHC management.
- The LHC will have a shift schedule and a protocol that defines the roles and responsibilities of CCC shift personnel.
- The LHC will have a protocol that defines how machine commissioning and development activities are scheduled and carried out.

## For both CMS & LHC

- LHC@FNAL will comply with all CERN and Fermilab safety and security standards.



# Scenarios

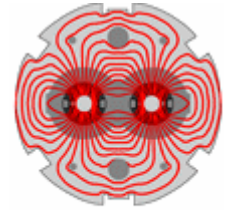


**Six Scenarios conceived and discussed**  
**Covered key aspects of LHC**  
**commissioning and operation**

- Hardware commissioning of a U.S./LARP deliverable
- Software contributions to LHC
- Beam studies from both CERN and U.S. perspectives (2)
- Diagnostics contributions to LHC via LARP
- First beam



# LHC Requirements



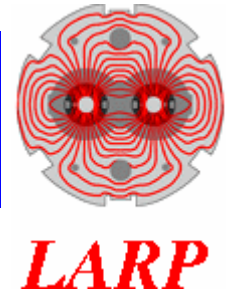
**LARP**

**Four broad categories of Requirements – requirements scale up as scope of activity changes**

- **Overarching ('to extend over or throughout')**
  - Confidentiality
  - space
- **Hardware Commissioning**
  - Access to data as U.S. hardware – magnets and instrumentation is installed and commissioned
  - Link to Field Control rooms in LHC tunnel
- **Beam Commissioning**
  - more activity in CCC
  - software development
  - Sector test
  - first beam
- **Post-LHC commissioning activities**
  - support of LARP deliverables
  - beam studies
  - LHC upgrades



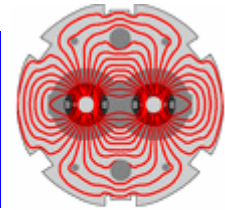
# LHC Requirements







# LHC Requirements

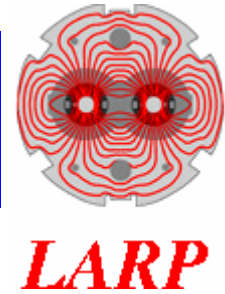


**LARP**

<b>Overarching</b>	2 – 1. LHC Confidentiality	Essential	Proposed–EH
	2 – 2. Enforcement of LHC Confidentiality	Essential	Proposed–SP
	2 – 3. LHC Space	Essential	Proposed–PM
<b>Hardware Commissioning</b>	2 – 4. LHC Hardware Commissioning Data Access [126]	Essential	Proposed–MJL
	2 – 5. LHC Hardware Commissioning Logbook [126]	Essential	Proposed–MJL
	2 – 6. FCR Communications [126]	Essential	Proposed–MJL
	2 – 7. FCR Shift Personnel [126]	Essential	Proposed–MJL
	2 – 8. LHC Hardware Commissioning Timescale [126]	Essential	Proposed–MJL
<b>Beam Commissioning</b>	2 – 9. LHC@FNAL Consoles [120] [138] [213]	Essential	Proposed–SP
	2 – 10. LHC Data Access [128] [138] [178]	Essential	Proposed–EM
	2 – 11. LHC Configuration Access [178]	Essential	Proposed–ML
	2 – 12. LHC Daily Schedule Meetings [138] [213]	Essential	Proposed–EH
	2 – 13. CCC Communications [120] [128] [138] [178] [213]	Essential	Proposed–EM
	2 – 14. CCC Communications Channels [120]	Essential	Incomplete–SP
	2 – 15. LHC Shift Personnel [128] [213]	Essential	Proposed–EM
	2 – 16. CCC Software [120] [178]	Essential	Proposed–SP
	2 – 17. CCC Software Maintenance [120]	Essential	Proposed–SP
	2 – 18. CCC Console Layout [120]	Essential	Proposed–SP
	2 – 19. LHC Development Environment [120] [178]	Essential	Proposed–SP
	2 – 20. LHC Data for Testing [120]	Essential	Proposed–SP
<b>post-Commissioning activities</b>	2 – 21. Beam Study Proposals [128]	Essential	Proposed–EM
	2 – 22. Beam Study Protocols [128]	Essential	Proposed–EM



# LHC Requirement 2-13



5 scenarios referenced

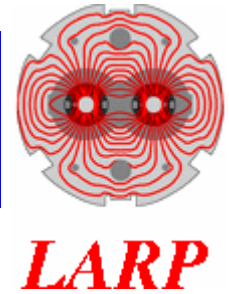
2 – 13. CCC Communications [120] [128] [138] [178] [213]	Essential	Proposed-EM
Several types of reliable 2-way communications shall exist between the CCC and LHC@FNAL. The types of communications shall include, but not be limited to: <ul style="list-style-type: none"><li>• Telephone (wired and wireless)</li><li>• On-demand video conferencing</li><li>• Simple, prompt electronic messaging with audio alerts (for example, “instant messaging”)</li><li>• E-mail</li><li>• Electronic logbook</li></ul>		

for example, Scenario 138:

[http://docdb.fnal.gov/CMS/DocDB/0001/000138/008/Scenario-Schottky\\_08.doc](http://docdb.fnal.gov/CMS/DocDB/0001/000138/008/Scenario-Schottky_08.doc)



# CMS/LHC Requirements

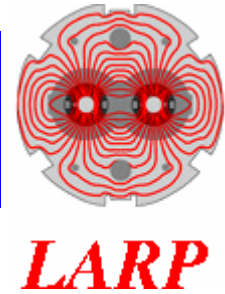


## Two categories of Requirements

- **Common Capabilities**
- **Operational Environment**
  - Shift area – separate space for CMS and LHC
  - Common area – joint LHC/CMS work
  - Working area – not on shift, but access to capabilities



# CMS/LHC Requirements



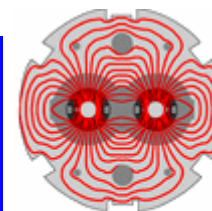
## General Capabilities

3 – 1. LHC@FNAL Shifts [126] [213]	Essential	Proposed–EH
3 – 2. LHC@FNAL Record of Shift Schedule	Essential	Proposed–EG
3 – 3. LHC@FNAL Directory	Essential	Proposed–EG
3 – 4. LHC@FNAL Web Page	Essential	Proposed–EG
3 – 5. LHC@FNAL Lifespan [138]	Essential	Proposed–JS
3 – 6. LHC@FNAL Shift Area [213]	Essential	Proposed–EH
3 – 7. LHC@FNAL Common Area	Essential	Proposed–PM
3 – 8. LHC@FNAL Display Sharing	Essential	Proposed–EG
3 – 9. LHC@FNAL Working Area	Essential	Proposed–SK
3 – 10. LHC@FNAL Social Area	Essential	Proposed–EH
3 – 11. LHC@FNAL Clocks	Essential	Proposed–EG

## Environment



# Joint Requirement 3-8

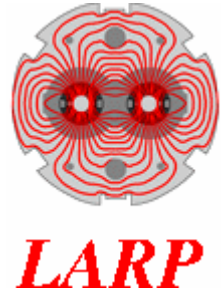


**LARP**

3 – 8. LHC@FNAL Display Sharing	Essential	Proposed-EG
To facilitate communication between CMS and LHC, LHC@FNAL consoles shall have the capability of displaying both CMS and LHC data.		



# CMS/LHC Constraints

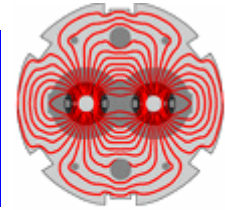


## Restrictions to capabilities

- Presented together
- Work in progress



# CMS/LHC Constraints

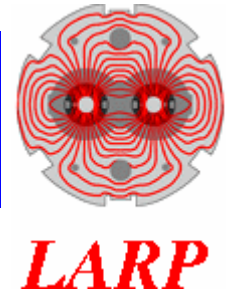


*LARP*

Communications	4 – 1. Communications	Essential	Incomplete-PM
	4 – 2. Computing	Essential	Incomplete-PM
	4 – 3. Reliable Networking	Essential	Incomplete-PM
Software	4 – 4. Software compliance	Essential	Proposed-EG
	4 – 5. Software repository	Essential	Proposed-EG
	4 – 6. Version control	Essential	Proposed-EG
	4 – 7. Parameters database	Essential	Proposed-EG
	4 – 8. Software testing	Essential	Proposed-EG
Security	4 – 9. Computing and Networking Security	Essential	Incomplete-PM
	4 – 10. LHC@FNAL Space Security	Essential	Incomplete-PM
Safety	4 – 11. General safety	Essential	Proposed-EG
	4 – 12. LHC@FNAL safety	Essential	Proposed-EG



# Summary



## Preliminary LHC Requirements are spelled out based on scenarios of expected activities

- extracted from scenarios which attempt to anticipate all major events of the LHC's lifespan
- participation by LARP, CERN, FNAL potential active players
- end result is to mirror the CCC for accelerator activities
- provide for joint use by LHC/LARP and CMS